



Western Washington University
Western CEDAR

Salish Sea Ecosystem Conference

2014 Salish Sea Ecosystem Conference
(Seattle, Wash.)

May 1st, 10:30 AM - 12:00 PM

Shoreline Monitoring Toolbox: Development and Goals for Implementation

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Toft, Jason David; Litle, Kate; and Palmer, Joleen, "Shoreline Monitoring Toolbox: Development and Goals for Implementation" (2014). *Salish Sea Ecosystem Conference*. 155.
<https://cedar.wvu.edu/ssec/2014ssec/Day2/155>

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Process-based assessments for local restoration planning

A photograph of a person in a green jacket and light-colored pants standing on a large log bridge over a river. The river has white water rapids and is surrounded by a dense forest of tall, thin trees. In the background, there are mountains with some snow patches under a clear blue sky. The text 'Process-based assessments for local restoration planning' is overlaid on the top right of the image.

Tim Beechie
NOAA Fisheries, Seattle

Why process-based restoration?

- Organisms are adapted to local habitat conditions
- Habitats are dynamic in space and time



Why process-based restoration?

Endangered Species Act

Purpose: Conserve ecosystems upon which listed species depend

Clean Water Act

Purpose: Restore and maintain the physical, chemical, and biological integrity of the nation's waters

Process-based restoration

- Goal:
 - Re-establish processes that sustain river and floodplain ecosystems
- Key features:
 - Not static – allows river dynamics
 - Self-sustaining – low maintenance cost
 - Allows natural biodiversity to emerge

The process-based principles

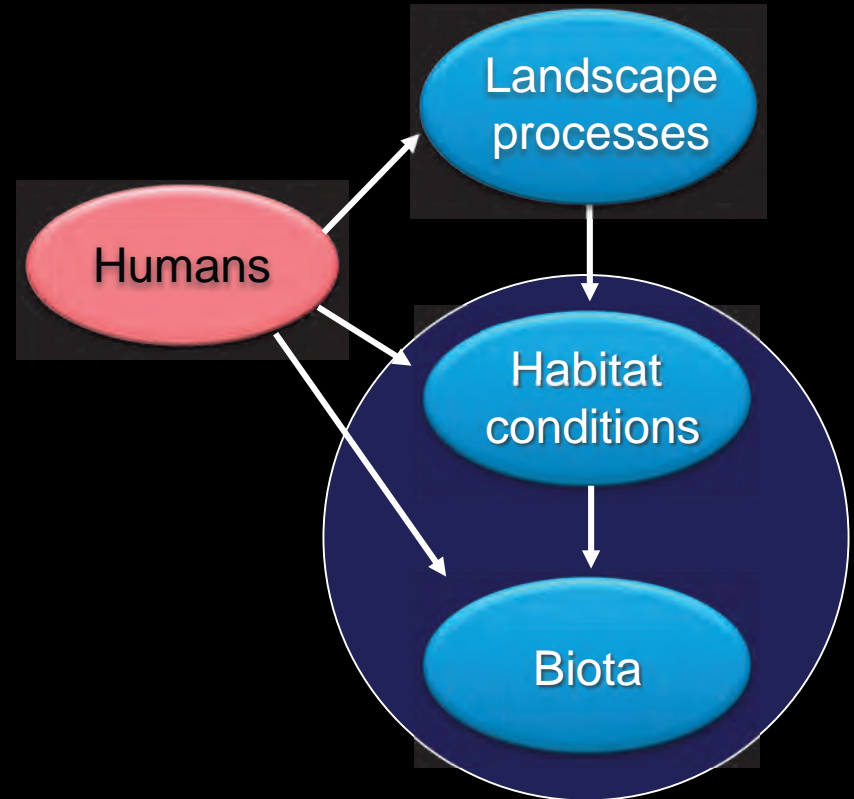
1. Treat root causes of ecosystem change
2. Target local restoration potential
3. Match the scale of restoration with the scale of physical and biological problems
4. Be explicit about expected outcomes and recovery time

How does it influence assessments?

- It helps us focus on the planning questions we need to answer

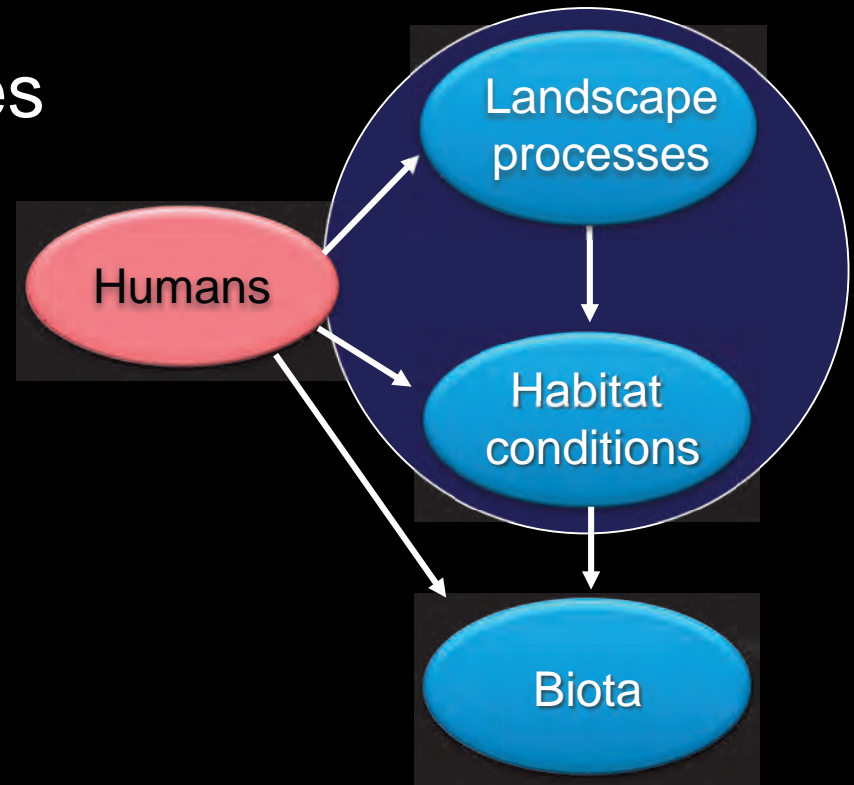
What do we need to know?

- How have habitats changed and altered biota?



What do we need to know?

- What are the root causes of habitat and biological change?
- How have habitats changed and altered biota?



How do we measure change?

- Assess 'potential'
 - Historical reference
 - Contemporary reference
 - Models/theory
- Assess current condition
 - Relative to 'potential'

What about the 'reference' debate?

- Arguments against
 - No possibility of achieving historical conditions
 - The reference is irrelevant to our evolving future
- Arguments for
 - The reference is not the target
 - Still our best estimate of potential
 - Past land use effects often larger than predicted climate effects

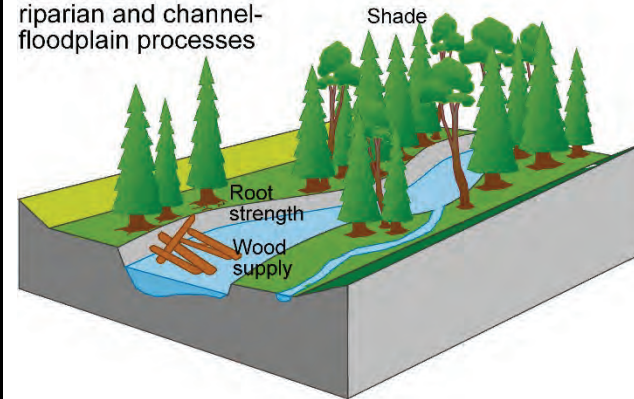
What about the 'reference' debate?

- Agreement on
 - A clear goal or guiding vision is critical
 - Contemporary references are useful

● Reach scale processes

- Mutable
- Influences key habitat elements like wood, shade, nutrients

Reach scale:
riparian and channel-
floodplain processes



Driving variables controlled by reach scale processes:
- root reinforcement
- wood supply

Reach-scale processes:
- riparian processes
- channel-floodplain interactions

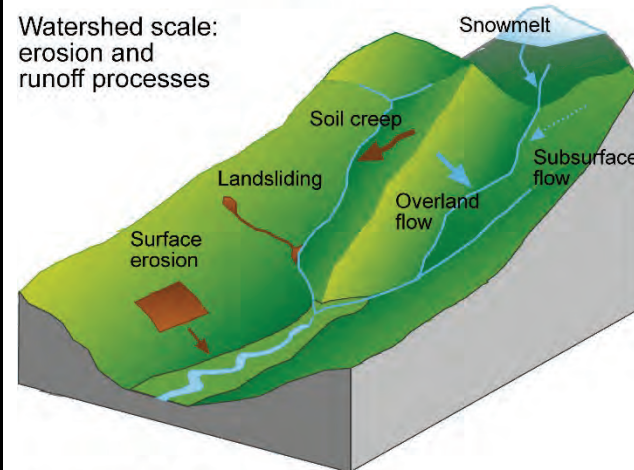
Spatial scale of processes:
 $10^{-1} - 10^1 \text{ km}^2$

Temporal scale of processes:
 $10^{-1} - 10^2 \text{ yr}$

● Watershed-scale processes

- Mutable
- Controls key habitat elements: sediment supply and hydrology

Watershed scale:
erosion and
runoff processes



Driving variables controlled by watershed-scale processes:
- discharge
- sediment supply, caliber

Watershed-scale processes:
- hydrology
- erosion

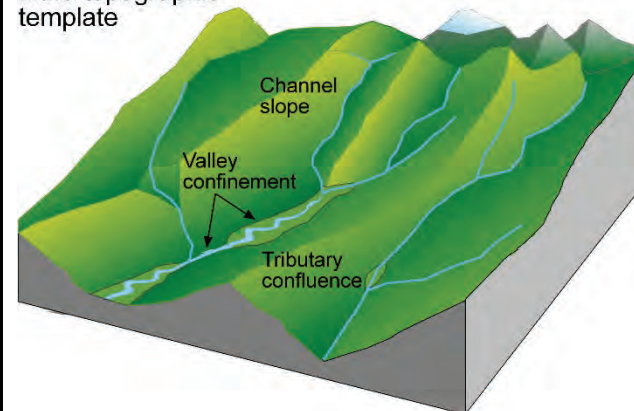
Spatial scale of processes:
 $10^{-1} - 10^4 \text{ km}^2$

Temporal scale of processes:
 $10^{-1} - 10^2 \text{ yr}$

● Landscape template

- Largely immutable
- Controls the range conditions that can be expressed

Litho-topographic
template



Driving variables controlled by the litho-topographic template:
- channel slope
- valley confinement

Landscape processes
- tectonics
- erosion

Spatial scale of processes:
 $>10^1 \text{ km}^2$

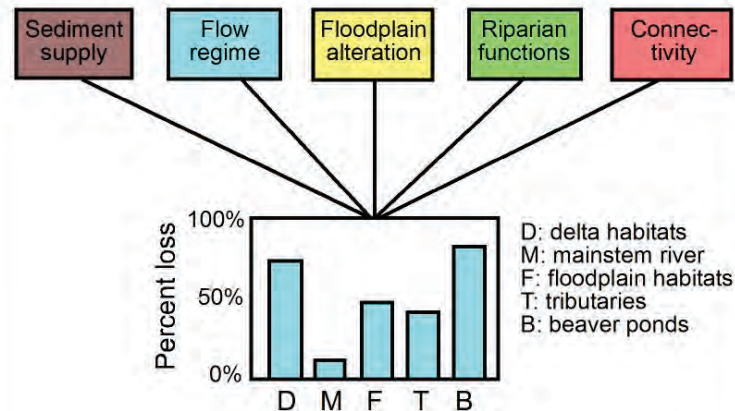
Temporal scale of processes:
 $>10^3 \text{ yr}$

Q1: habitat and species changes

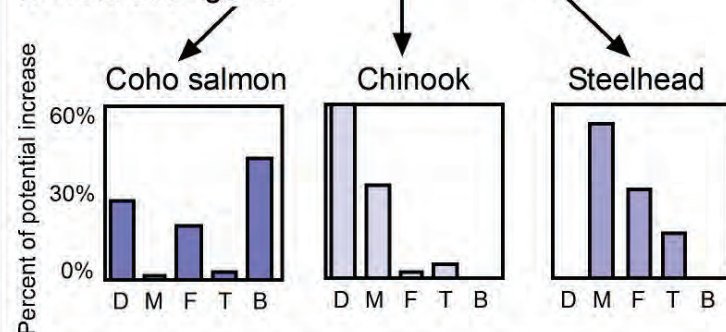
- Summarize habitat changes across the restoration area
- Quantify importance of each habitat loss to species of interest

a. Analysis and selection of actions

Analysis of habitat change and causes relative to reference

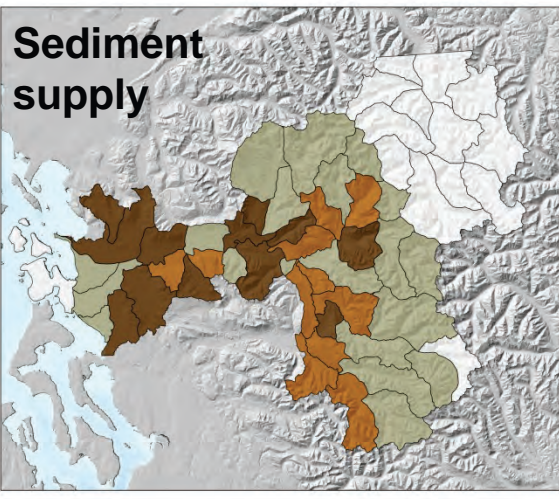


Biological effects and selection of actions relative to restoration goals

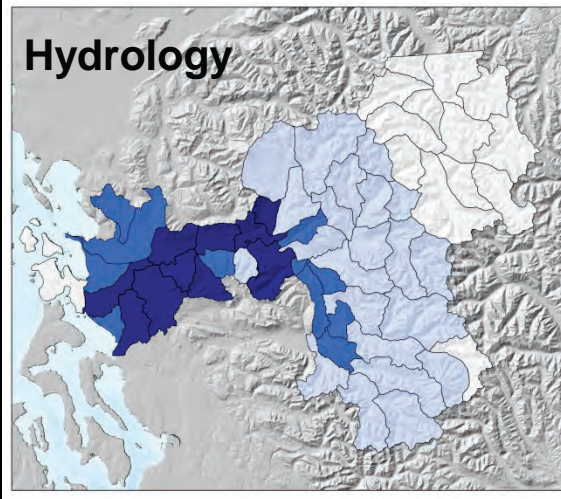


Q2: causal process changes

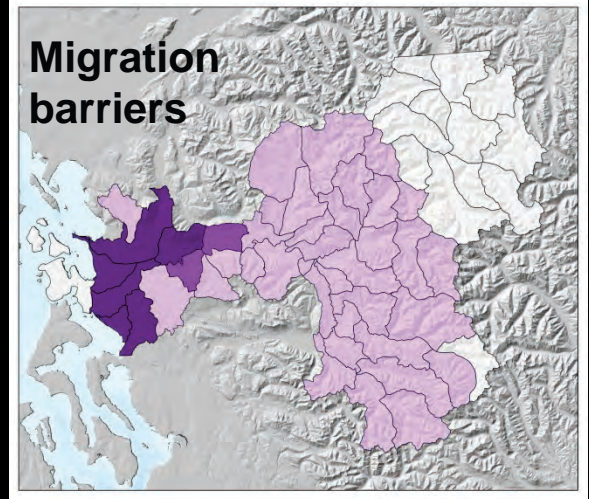
**Sediment
supply**



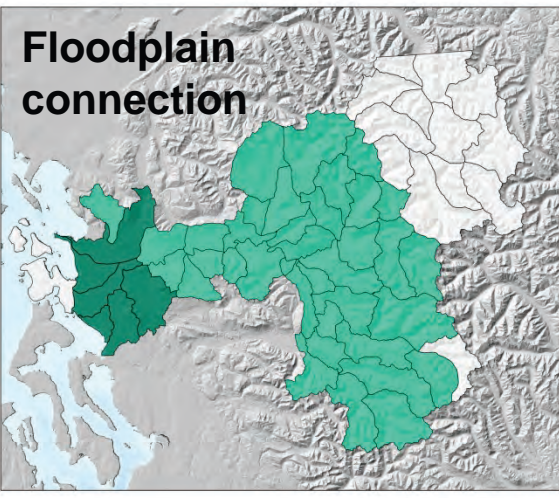
Hydrology



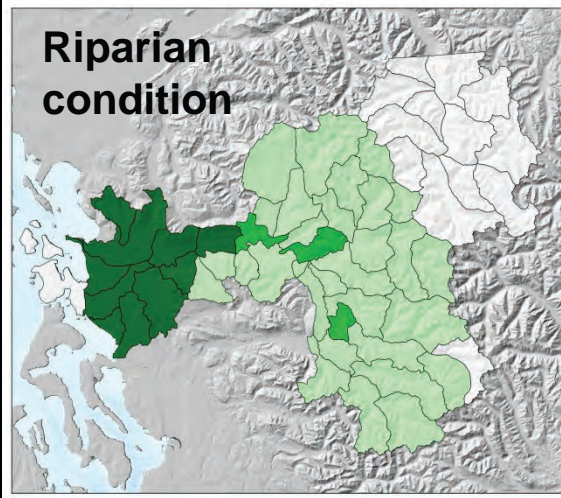
**Migration
barriers**



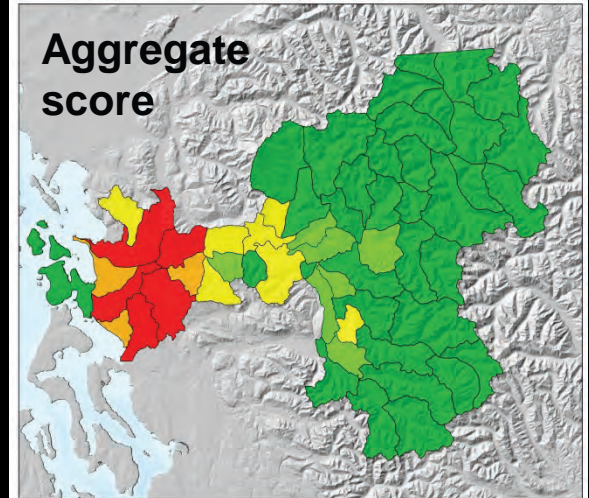
**Floodplain
connection**



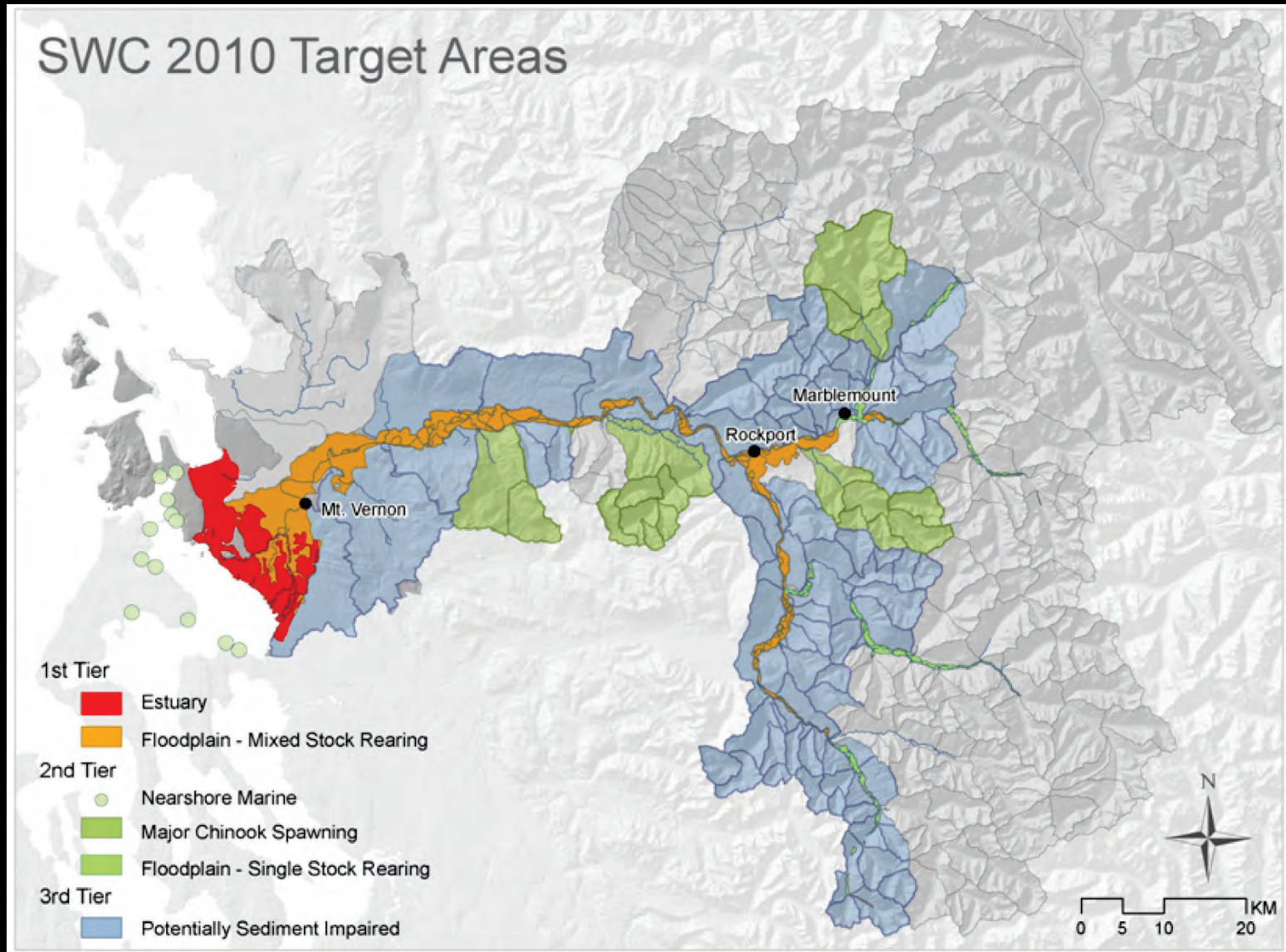
**Riparian
condition**



**Aggregate
score**



Develop a strategy



If you have multiple priorities

- Look for overlaps
- Look for funding synergies

Closing points

- It's all about the questions
 - Science questions
 - Policy questions
- Have a clear goal
- Understanding the hierarchy of processes is critical